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02MRA0353

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Roberto Conti
Serial No.: 10/622,091
Filed: July 17, 2003
Examiner: Unknown
Group Art Unit: 3683
For: BRAKE ROTOR

TRANSMITTAL OF CERTIFIED COPY

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

With regard to the above-referenced patent application, enclosed is a certified copy of priority document no. 0216749.2.

Respectfully submitted,

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Dated: October 23, 2003

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Beth A. Beard



INVESTOR IN PEOPLE

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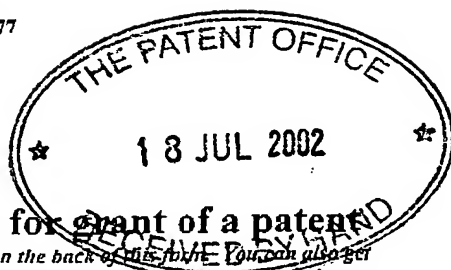
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1977/02 E734457-3 001038
P01/7700 0.00-0216749.2

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1. Your reference		P303416GB/JBJ/48156	
2. Patent application number (The Patent Office will fill in this part)		18 JUL 2002	
3. Full each	0216749.2	Meritor Heavy Vehicle Systems Cameri SpA Strada Provinciale Cameri-Bellinzago Km. 5 Cameri (Novara) 28062 Italy	
Patents ADP number (if you know it)		8329195001	
If the applicant is a corporate body, give the country/state of its incorporation		Italy	
4. Title of the invention		Brake Rotor	
5. Name of your agent (if you have one) "Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)		WITHERS & ROGERS Goldings House 2 Hays Lane London SE1 2HW	
Patents ADP number (if you know it)		1776001	
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and (if you know it) the or each application number		Country	Priority application number (if you know it)
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application		Number of earlier application	
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Description 4 /

Claim(s) 2 /

Abstract

Drawing (s) 3 + 3

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Priority documents

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Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77) One

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application

Signature Withers + Rogers Date 18/7/2002

12. Name and daytime telephone number of person to contact in the United Kingdom John B Jones 0121 245 3900

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P303416GB

Brake Rotor

The present invention relates to brake rotors, and in particular brake rotors for use on vehicles.

Known brake rotors include a mounting flange having a plurality of circumferentially equally spaced mounting holes. The holes are used to fix the rotor to a wheel hub of the vehicle. The mounting flange includes a circular central hole which fits over various wheel hub components.

However in use, such known brake rotors can develop radial cracks between an inner edge of the mounting holes and the mounting flange central hole.

An object of the present invention is to produce a brake rotor which is less susceptible to developing such cracks.

Thus according to the present invention there is provided a brake rotor having an annular disc connected to an annular mounting flange, the mounting flange defining a radially inner flange wall and including a plurality of circumferentially spaced mounting holes, in which the flange wall includes a plurality of recesses, with each recess situated circumferentially between adjacent mounting holes.

It has been found that by providing recesses between each mounting hole, the hoop stresses which develop in use due to differential thermal expansion of different parts of the brake rotor are reduced. In particular the thermal stresses in that part of the brake rotor immediately radially inside each mounting hole can be reduced to an extent whereby cracks no longer form.

The invention will now be described, by way of example only, with reference to the accompanying drawings in which:-

Figure 1 is an isometric view of a brake rotor according to the present invention,

Figure 2 is an axial view of the rotor of figure 1,

Figure 2A is an enlarged view of figure 2, and

Figure 3 is a cross section view of the rotor of figure 2 taken along the line AA.

With reference to the figures there is shown a brake rotor 10 having an annular disc 12 connected to a generally annular mounting flange 14.

Annular disc 12 has brake cheek 16 and 17 which are spaced apart by ventilation vanes 18. The brake cheeks 16 and 17 together with the ventilation vanes 18 define ventilation holes 20. Brake cheeks 16 and 17 define braking faces 16A and 17A respectively.

The mounting flange 14 includes a plurality (in this case 12) of mounting holes 22. The mounting holes are circumferentially equispaced and have a pitch circle diameter of B, in this case 192 millimetres.

The mounting holes have a nominal diameter of 17 millimetres and thus the inner edges of the mounting holes define a circle of diameter C in this case 175 millimetres.

The mounting flange further defines a radially inner flange wall 24 in the form of an interrupted circle of diameter D, in this case 162 millimetres.

The radially inner flange wall is interrupted by axial recesses in the form of grooves 26 with each groove being positioned circumferentially between adjacent mounting holes.

Each groove has a substantially semicircular radially outermost end 28 (see figure 2A) with the centre of the semicircle being shown at 30.

Centres 30 define a circle of diameter E, in this case 170 millimetres.

The radius of the semicircular end of the grooves is $7\frac{1}{2}$ millimetres and thus the radially outer edges of the grooves define a circle of diameter F, in this case 185 millimetres.

The innermost edge of cheek 16 is positioned at a diameter G, in this case 234 millimetres.

Consideration of figure 2 and the upper half of figure 3 shows that certain ventilation vanes 18A extend radially inwardly only as far as the inner edge of cheek 16.

However, consideration of figure 2 and the lower part of figure 3 show that certain other vanes 18B extend radially inwardly passed the radially inner edge of cheek 16 to a diameter H, in this case approximately 192 millimetres, thus forming an inner vane portion 32. It can be seen that inner vane portion 32 projects axially from the mounting flange 14. Furthermore, it would be appreciated that vanes 18A are circumferentially aligned with an associated groove 26.

In this embodiment the ventilation vanes 18 are all radially orientated. Note however that in further embodiments the ventilation vanes could be curved.

Consideration of figure 3 shows that the mounting flange 14 has axially outwardly orientated faces 14A and 14B. It would be appreciated that mounting flange 14 is offset to the left when viewing figure 3 relative to the annular disc 12.

Furthermore a plane defined by face 14B is situated between the planes defined by brake faces 16A and 17A. Thus mounting flange 14 is offset from, but nevertheless overlaps with, the annular disc 12.

It has been found that by providing the grooves in the position as indicated, the material 34 (see figure 3) situated between the mounting holes and the radially inner flange wall is subject to lower thermal stresses and hence the likelihood of cracking in this region is significantly reduced.

Certain aspects of the geometry of the mounting flange should be noted.

The mounting hole pitch circle diameter B (192 millimetres) is larger than the groove end centre pitch circle diameter E (170 millimetres).

The mounting hole pitch circle diameter B (192 millimetres) is larger than the groove radially outer edge circle diameter F (185 millimetres).

The groove end centre pitch circle diameter E (170 millimetres) is less than the circle diameter C (175 millimetres) defined by the radially innermost portion of the mounting holes.

The diameter of the circle F (185 millimetres) defined by the groove radially outer edges is larger than the diameter of the circle C (175 millimetres) defined by the radially innermost portion of the mounting holes.

The brake rotor including in particular the inner vane portions 32 is typically cast. Whilst the grooves may also be cast, when they are machined, beneficially the groove radially outer edge circle diameter F (185 millimetres) is designed to be smaller than the circle H (192 millimetres) defined by the inner edge of the inner vane portions 32. This allows for machine of the rotor flange without the requirement to machine the inner vane portions 32.

Claims

1. A brake rotor having an annular disc connected to an annular mounting flange, the mounting flange defining a radially inner flange wall and including a plurality of circumferentially spaced mounting holes, in which the flange wall includes a plurality of recesses, with each recess situated circumferentially between adjacent mounting holes.
2. A brake rotor as defined in claim 1 in which each recess is in the form of an axially orientated groove.
3. A brake rotor as defined in claim 2 in which the grooves have a substantially semicircular radially outermost end, with each and having a centre, the centre defining a groove end centre pitch circle diameter (E).
4. A brake rotor as defined in any preceding claim in which the grooves have radially outer edges defining a groove radially outer edge circle having a diameter (F).
5. A brake rotor as defined in any preceding claim in which the mounting holes define a mounting hole pitch circle diameter (B).
6. A brake rotor as defined in any preceding claim in which the mounting holes have radially inner edges defining a mounting hole radially inner edge circle having a diameter (C).
7. A brake rotor as defined in claim 5 when dependent upon claim 3 in which the mounting hole pitch circle diameter (B) is greater than the groove end centre pitch circle diameter (E).
8. A brake rotor as defined in claim 5 when dependent upon claim 4 in which the mounting hole pitch circle diameter (B) is greater than the groove radially outer edge circle diameter (F).

9. A brake rotor as defined in claim 6 when dependent upon claim 3 in which the groove end centre pitch circle diameter (E) is less than the mounting hole radially inner edge circle diameter (C).
10. A brake rotor as defined in claim 6 when dependent upon claim 4 in which the groove radially outer edge circle diameter (F) is greater than the mounting hole radially inner edge circle diameter (C).
11. A brake rotor as defined in any preceding claim including ventilation vanes between opposing braking faces of the annular disc.
12. A brake rotor as defined in claim 11 in which at least some ventilation vanes include inner vane portions which extend inward of a radially inner edge of the annular disc.
13. A brake rotor as defined in claim 12 in which said inner vane portions further project from the mounting flange.
14. A brake rotor as defined in claim 12 or 13 in which said inner vane portions are substantially radially in line with the recess.
15. A brake rotor as defined in any one of claims 12 to 14 when dependent upon claim 4 in which the radially inner edges of said inner vane portions define a circle having a diameter (H) that is greater than the groove radially outer edge circle diameter (F).
16. A brake rotor as defined in any preceding claim in which the annular disc is axially offset relative to the annular mounting flange.
17. A brake rotor as defined in claim 16 in which the annular disc axially overlaps the annular mounting flange.

1/3

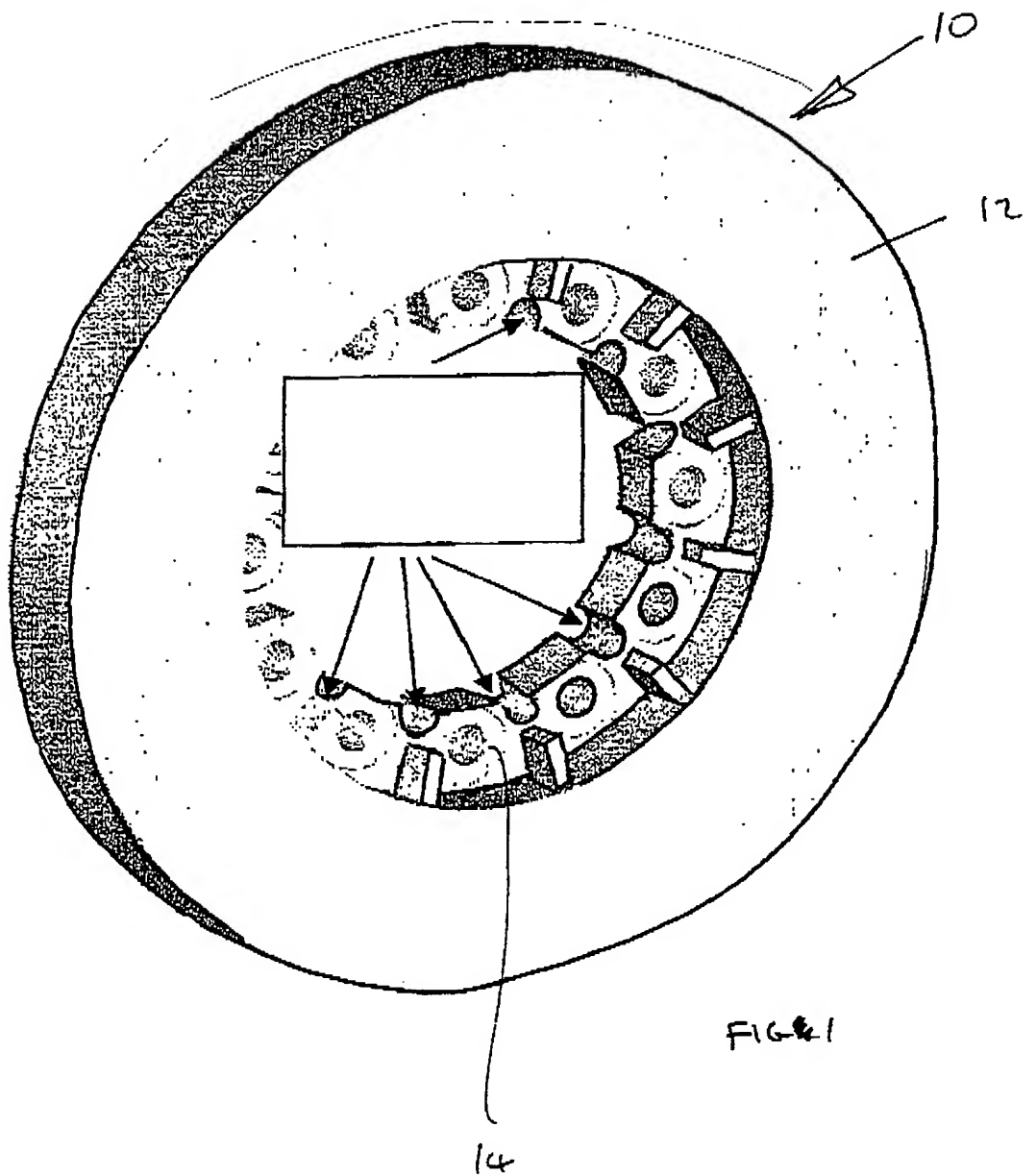
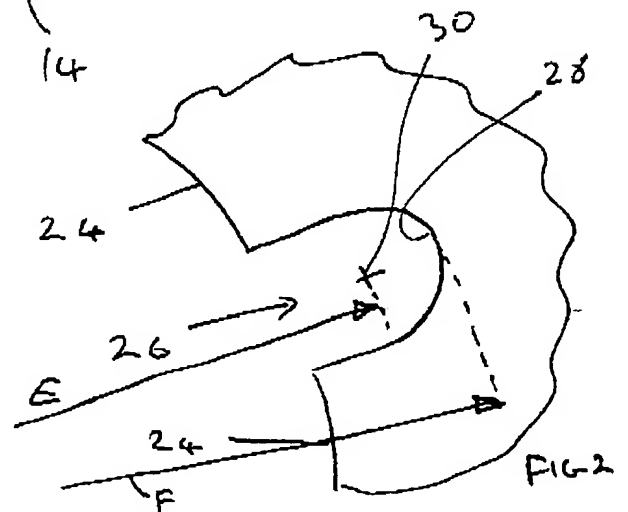
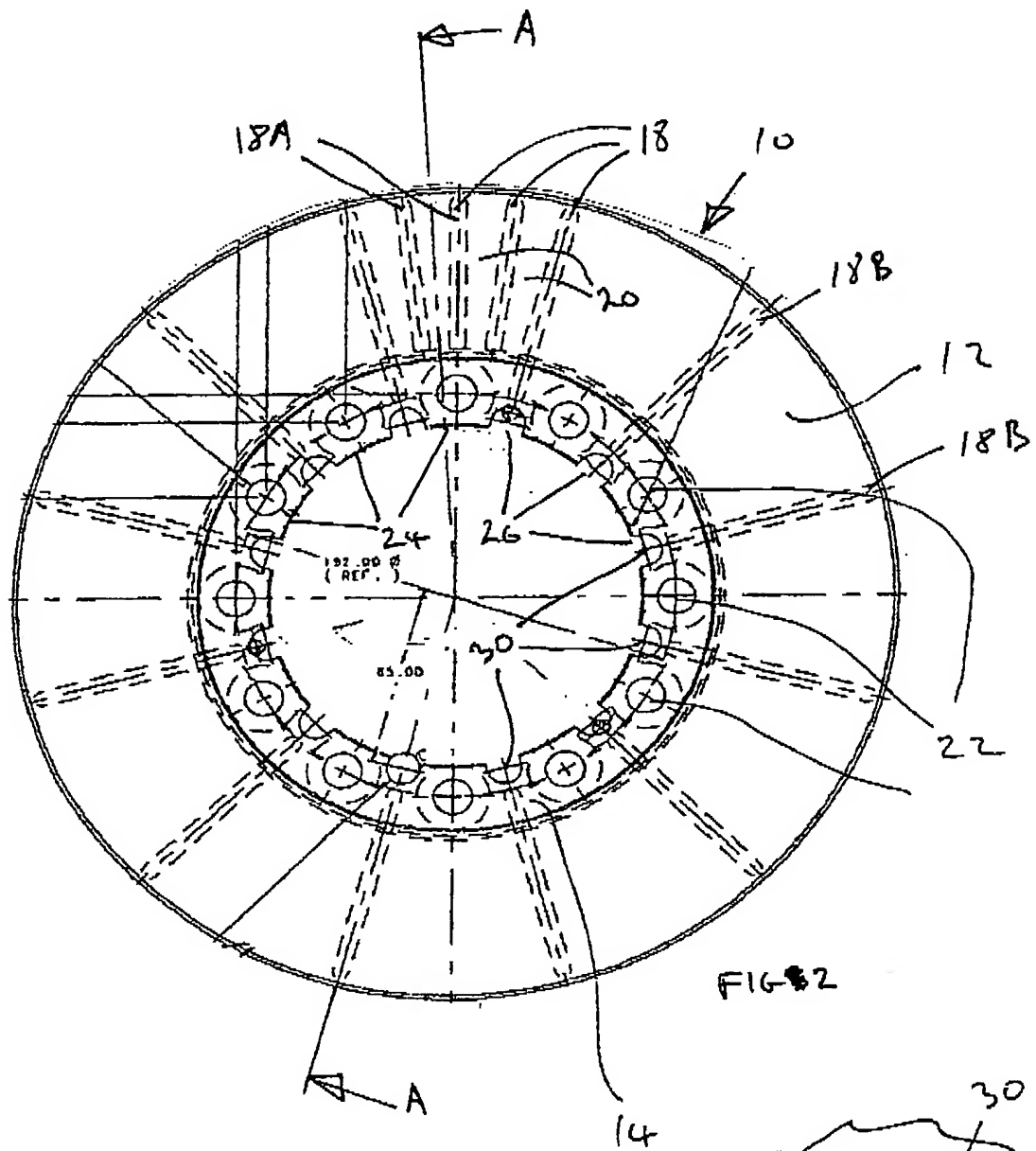


FIG. 1



3/3

